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Impact of preoperative systemic inflammation on clinical recovery following arthroscopic rotator cuff repair

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Abstract

Aim: This study aimed to investigate the impact of preoperative inflammation values on postoperative recovery in patients who underwent arthroscopic rotator cuff repair.

Materials and Methods: A total of 36 patients who underwent surgery between January 2023 and June 2024 at the Giresun State Hospital Orthopedics and Traumatology Clinic were included. The preoperative inflammation values of the patients were compared with the pre-to-postoperative changes in Oxford Shoulder Score (OSS) and Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) scores.

Results: The mean age of the patients was 64.25 (43-82). Of the patients, 61.1% were female. It was determined that 72.2% of the tears were on the right side, and the most common tear size was moderate (36.1%). Diabetes was observed in 19.4% of the patients. There were significant changes in OSS and Quick DASH scores before and after surgery ($p < 0.001$). No statistically significant correlation was found between the change in Quick DASH and OSS scores and inflammatory mediators ($p > 0.05$).

Discussion: We concluded that the preoperative inflammation level did not contribute to clinical and functional recovery after arthroscopic rotator cuff repair.

Keywords

arthroscopic rotator cuff repair, Oxford Shoulder Score, Quick DASH score

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Introduction

Rotator cuff tears (RCT) are among the most frequently encountered musculoskeletal pathologies of the shoulder joint [1]. Nowadays, different surgical techniques such as open, mini-open, and arthroscopic methods are used for cases requiring surgical intervention [2]. Arthroscopic rotator cuff repair (RCR) is currently considered the gold standard in the treatment of these tears [3]. However, the level of functional recovery following this surgical procedure can vary considerably among patients. Although clinical outcomes are influenced by numerous factors, the patient's systemic inflammatory response is also considered an important determinant [4].

In recent years, certain systemic inflammatory markers based on hematological parameters have been reported as prognostic indicators in various surgical procedures [5-6]. These markers are known as Neutrophil-to-Lymphocyte Ratio (NLR), Platelet-to-Lymphocyte Ratio (PLR), Lymphocyte-to-Monocyte Ratio (LMR), Systemic Immune-Inflammation Index (SII) [(Neutrophil × Platelet)/Lymphocyte], and Systemic Inflammation Response Index (SIRI) [(Neutrophil × Monocyte)/Lymphocyte]. These markers, reflecting the patient's preoperative inflammatory status, may be related to postoperative processes such as wound healing, tissue regeneration, and pain levels. Some studies in orthopedic surgery have reported that high NLR and SII levels increase the risk of postoperative complications and prolong the recovery process [7].

The use of clinical measurement tools is of great importance in the objective evaluation of functional recovery. In this context, OSS and Quick DASH scales are widely accepted as reliable and valid tools for assessing upper extremity function [8-9]. These tools are frequently used to monitor changes in functional levels of patients, especially following shoulder surgery.

The aim of this study is to examine the levels of systemic inflammatory markers before surgery in patients undergoing arthroscopic RCR and to evaluate the effects of these markers on OSS and Quick DASH scores measured at the 3rd postoperative month. In this direction, the potential role of hematological inflammatory parameters in predicting postoperative clinical recovery will be investigated.

Materials and Methods

In our clinic (Ilhan Ozdemir State Hospital Orthopedic Clinic), the results of 36 patients who met the inclusion criteria among 55 patients who underwent surgical treatment for full-thickness RCT between January 2023 and June 2024 were retrospectively evaluated. Fourteen of the patients were male, and twenty-two were female. The average patient age was 64.25 years (range: 43–82). In 26 patients, the surgery was performed on the right shoulder, and in 10 patients, on the left shoulder.

Inclusion Criteria

Patients who underwent arthroscopic repair for full-thickness RCT that did not improve despite at least 3 months of conservative treatment, and who were followed for at least three months after treatment, were included in the study.

Exclusion Criteria

Patients with partial-thickness RCT, irreparable RCT, partially repaired RCT, subscapularis tears, those who underwent mini-open RCR, had glenohumeral arthritis, active infection, or a history of inflammatory diseases such as rheumatoid arthritis were excluded from the study.

Diagnoses were made based on clinical physical examination and Magnetic Resonance Imaging (MRI). Tear sizes were classified as small, medium, or large based on MRI findings. For clinical outcome evaluation, OSS and Quick DASH scores were used. From the patients' preoperative complete blood count tests, values for neutrophils, lymphocytes, monocytes, and platelets were obtained. Using these, the NLR, PLR, and LMR were calculated. Additionally, the SIRI and the SII were computed.

Surgical Technique

All surgeries were performed by the same surgeon. Under general anesthesia, the patients were positioned in the lateral decubitus position. A posterior viewing portal was established to examine the intra-articular space. Then, the subacromial space was accessed, and subacromial bursectomy was performed, and one or two lateral portals were created to examine the rotator cuff. A double-row repair technique was applied to all. A tenotomy of the long head of the biceps tendon was performed in all patients. Acromioplasty was also performed in all patients, cautiously and without being aggressive.

Postoperative Rehabilitation

The same rehabilitation protocol was applied to all patients postoperatively. Elbow exercises were started on the first postoperative day. Between the 2nd and 6th weeks, shoulder range of motion was achieved through pendulum and passive exercises. After the 6th week, active exercises were initiated, followed by resistance exercises after the 12th week [10].

Statistical Analysis

Normality assumptions were assessed using skewness and kurtosis values. If skewness and kurtosis coefficients were within the range of ±1.5, the data were considered normally distributed [11]. For comparing preoperative and postoperative Quick DASH and OSS scores that followed normal distribution, the paired samples t-test was used. The difference between postoperative and preoperative Quick DASH and OSS scores was calculated to determine the amount of change. For the relationships between changes in scores that did not follow normal distribution and inflammatory mediators, the Spearman rho correlation coefficient was used. For comparing changes in scores according to demographic characteristics, the Kruskal-Wallis H test was used for three-category variables, and the Mann-Whitney U test was used for two-category variables. Analysis results were presented as mean, standard deviation (Mean ± SD), median, minimum, and maximum (Median (min–max)) for quantitative data, and as frequency (n) and percentage (%) for categorical data. A significance level of "$p < 0.05$" was considered in all calculations. All statistical analyses were performed using IBM SPSS Statistics, version 26.0 (IBM Corp., Armonk, NY, USA) [12].

Ethical Approval

The study was approved by the Ethics Committee of Giresun University Education and Research Hospital Clinical Research Ethics Committee (Date: 2024-12-11, No: 01).

Results

The demographic and clinical data of the patients are presented

in Table 1. The mean age of the 36 patients included in the study was 64.25 years (range: 43–82). Of the patients, 61.1% were female. It was observed that in 72.2% of the cases, the operated extremity was the right side. When the tear sizes were examined, it was found that the majority (36.1%) had medium-sized tears. Diabetes was observed in 19.4% of the patients (Table 1).

There was a statistically significant difference between the patients' preoperative and postoperative Quick DASH scores ($p < 0.001$). The mean preoperative Quick DASH score was 77.89, whereas the mean postoperative Quick DASH score was 22.02. Likewise, a statistically significant difference was observed between the preoperative and postoperative OSS scores ($p < 0.001$). The mean preoperative OSS score was 9.75, while the mean postoperative OSS score was 37.17. A significant decrease in DASH scores and a significant increase in OSS scores were observed postoperatively (Table 2).

A statistically significant weak negative correlation was found between the amount of change in OSS scores and patients' age ($r = -0.338$, $p = 0.044$). However, there was no statistically significant correlation between the change in Quick DASH scores and age ($p = 0.343$). No statistically significant relationship was found between changes in QuickDASH and OSS scores and inflammatory mediators ($p > 0.05$) (Figure 1).

There was no statistically significant relationship between gender, side of surgery, tear size, or the presence of diabetes and the amount of change in Quick DASH scores ($p > 0.05$).

Similarly, no statistically significant relationship was found between gender, surgical side, tear size, or the presence of diabetes and the amount of change in OSS scores ($p > 0.05$).

Discussion

Arthroscopic RCR is widely recognized as an effective method to restore shoulder function and improve patients' quality of life. However, the postoperative recovery process is influenced by many patient-specific factors. This study shows that Quick DASH and OSS scores significantly improved postoperatively. Current literature supports our clinical findings. Our study is unique in that it is the first to investigate the importance of systemic inflammatory markers in terms of clinical and functional recovery following arthroscopic rotator cuff repair.

In a prospective study conducted by Reddy et al. [13], preoperative factors affecting outcomes after RCR were analyzed in detail. They concluded that age is a significant factor influencing outcomes after RCR. It was found that functional outcomes were better in the younger age group (under 55) compared to the older group (over 65). Consistent with current literature, many publications have shown better results in younger patients, although some authors have found that older patients report higher satisfaction than younger ones [14]. In our study, a statistically significant weak negative correlation was found between patients' age and changes in OSS scores. However, no statistically significant difference was found between changes in Quick DASH scores and age.

In their study, Chung et al. [15] evaluated factors such as the presence of diabetes, tear size, and side of the tear, and found that diabetic patients had worse outcomes. They also noted that perioperative hypoglycemia had a negative impact, recommending that surgery should be performed after achieving reasonable glycemic control for better results. In our study, no significant difference was found between the presence of diabetes and clinical or functional outcomes. We believe this may be due to the small number of diabetic patients in our study. In terms of tear size and side, they found no effect on clinical and functional outcomes. It is well known that when performed properly by experienced hands, arthroscopic RCR leads to significant improvement regardless of the tear size or side. Our study supports the literature by finding no significant relationship between outcomes and either tear size or surgical side. Accurate analysis of biological and clinical factors affecting surgical outcomes will enhance treatment success. Studies are still ongoing today to increase the success of treatment. In this context, systemic inflammatory markers are gaining attention in the current literature. Markers such as NLR, PLR, LMR, SII, and SIRI are inexpensive, easy to obtain, and accessible through common blood tests. Literature shows that these markers are not only useful in diagnosing disease but also in predicting prognosis and monitoring treatment response.

In the retrospective study conducted by Sun et al. [16], it was reported that the outcomes of arthroscopic rotator cuff repair were favorable regardless of tear size, and that patients with poorer postoperative outcomes had lower preoperative LMR ratios. Based on these findings, it was concluded that preoperative LMR, as an indicator of systemic inflammation, may serve as a prognostic factor for rotator cuff repair. In another retrospective study by Öner et al. [17], 63 patients were evaluated, and it was found that patients with higher preoperative NLR ratios experienced greater postoperative pain and shorter block durations. Accordingly, it was concluded that postoperative pain levels may be predicted through an objective parameter. In our study, however, we found no significant association between preoperative systemic inflammation levels and postoperative functional outcomes.

In a literature review by Islam et al. [18], it was concluded that these indices show promising results in predicting outcomes in high-risk patient groups such as cancer, sepsis, polytrauma, acute ischemic stroke, and acute coronary syndrome, but that their predictive performance is limited when used alone for specific conditions. In a retrospective study by Alsabani et al. [7], on 196 orthopedic surgery patients, it was found that patients with higher SII values had longer hospital stays; however, no significant differences were found in age, gender, ASA score, surgery duration, Intensive Care Unit (ICU) admission, or ICU stay duration. In another retrospective study by Vitiello et al. [19], on 53 patients with periprosthetic joint infection, higher SIRI and MLR values were associated with successful treatment. These indices could guide clinicians in determining the timing of second-stage surgeries, although further studies are needed. In a meta-analysis by Pan et al. [20], on geriatric hip fractures, high NLR and SII values were associated with an increased long-term mortality risk in elderly hip fracture patients. In our study, no significant relationship was found between preoperative systemic inflammation level and clinical and functional recovery.

Limitations

The small sample size and the retrospective design are

limitations of our study. Further large-scale, prospective studies are warranted to validate our findings.

Conclusion

In our study, while a significant improvement was observed in the scores following surgery, we concluded that preoperative systemic inflammation levels had no effect on postoperative recovery.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content, including study design, data collection, analysis and interpretation, writing, and some of the main line, or all of the preparation and scientific review of the contents, and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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